CHAPTER 900
LANDSCAPE ARCHITECTURE

Topic 901 - General

Index 901.1 - Landscape Architecture Program

The Landscape Architecture Program is responsible for the development of policies, programs, procedures, and standards for all aspects of the Roadside Program which consists of Highway Planting, replacement highway planting, mitigation planting, highway planting revegetation and restoration, Safety Roadside Rest Areas, Roadside Management, Beautification and Modernization, Scenic Highway, Classified Landscape Freeways, Transportation Art, Blue Star Memorial Highway programs, and planting in conjunction with Noise Abatement Features.

This chapter provides mandatory, advisory and permissive standards as defined in Index 82.1. The Division of Design is responsible for approving exceptions to all mandatory standards (**Boldface** type) and the District Directors are responsible for approving exceptions to all advisory standards (indicated by Underlining) as discussed in Index 82.2. All other guidance in this Chapter pertaining to the design of planting and irrigation systems is the responsibility of the Landscape Architecture Program. Deviations from this guidance may be permitted with the approval of the Landscape Architecture Program. See the Project Development Procedures Manual (PDPM) Chapter 29 regarding process and procedures for approval of deviations from Landscape standards.

901.2 Cross References

Several highway landscape architectural terms are defined in Index 62.5 of this manual.

The PDPM contains general definitions, policies, and procedures concerning planting and conservation of vegetation and explains procedures and responsibilities for developing highway planting projects. The manual also includes guidelines for programs such as the Blue Star Memorial Highway and Transportation Art programs.

The standard Environmental Reference contains guidelines and responsibilities for determining scenic resources during the project development process.

The Standard Encroachment Permits Reference contains procedures and guidelines for planting design and administering planting by others, through permits.

The Construction Manual discusses materials and methods involved in erosion control and planting and irrigation. It describes allowable options for materials and work methods called for in the project specifications as well as Landscape Architect involvement during construction.

The Maintenance Manual contains instructions about the maintenance of roadside vegetation and other roadside features.

The Landscape Architecture Standards booklet provides guidelines for the preparation of highway planting plans, specifications, and estimates.

The Plant Setback and Spacing Guide contains minimum plant spacing and distances from various elements within the highway right of way.

The California Native Wildflower Checklist and Native Plant Database are references of native species to assist designers in selecting plants and establishing native roadside vegetation that conform to Federal wildflower requirements.

The Water Conservation Deputy Directive (DD-13) explains the Department's policy and provides guidelines for the use of both potable and nonpotable water.

Topic 902 - Highway Planting Standards and Guidelines

902.1 General

This section provides standards and guidelines for the design of planting and irrigation systems.

Highway planting is vegetation placed for aesthetic, safety, environmental mitigation, storm water pollution prevention, or erosion control purposes, and includes necessary irrigation

systems, inert materials, mulches, Design For Safety features and appurtenances.

In addition, highway planting is used to satisfy the need for headlight glare reduction, fire retardance, windbreak protection, or graffiti reduction on retaining walls and noise barriers.

(1) Design Considerations. Planting and irrigation systems should be designed to achieve a balance between aesthetics, safety, maintainability, cost-effectiveness, and resource conservation. Plantings should be responsive to local community goals.

(a) Aesthetics. Highway planting and replacement planting shall integrate the facility with the adjacent community or natural surroundings; buffer objectionable views of the highway facility for adjacent homes, schools, parks, etc.; soften visual impacts of large structures or graded slopes; screen objectionable or distracting views; frame or enhance good views; and provide visually attractive interchanges as entrances to communities.

Materials and planting compositions should be regionally appropriate and visually compatible with local indigenous plant communities or surrounding landscape planting.

Plantings should be designed according to the perspective of the viewer. For example, compositions viewed by freeway motorists should be simplified and large scale. Plantings viewed primarily by pedestrians may be designed with greater detail.

Contour grading, with careful preservation and enhancement of existing plants and natural features should be integrated into the overall composition.

(b) Safety. Planting and irrigation facilities shall be designed to ensure the safety of both maintenance workers and the public.

To understand potential hazards to maintenance workers, designers should be familiar with Chapter 8, "Protection of Workers", of the Maintenance Manual.

Selection and location of plants shall be carefully considered to maintain sight distance and clear recovery zone setbacks. Planting shall not interfere with the function of safety features such as shoulders, barriers, guardrail, traffic or regulatory devices, warning and guide signs or with motorists' view of the road.

Irrigation components should be clustered and located adjacent to access gates, maintenance vehicle pullouts, maintenance access roads or other areas away from traffic.

Highway planting projects, including highway planting restoration, should incorporate safety concepts that include, but are not limited to, the following:

- Access - Provide access gates for maintenance personnel from local streets and frontage roads. Provide paved maintenance vehicle pullout areas away from traffic on high volume highways and other areas where access cannot be made from local streets and roads. Maintenance access roads provide access to the center of loop areas or other wide, flat areas.
- Minimize Exposure to Traffic and Reduce the Need for Shoulder or Lane Closures - Locate irrigation system components and vegetation away from shoulder areas, gore areas, and narrow island areas between ramps and traveled way to reduce the need for shoulder or lane closures, to perform pruning or other maintenance operations. Place irrigation components that require regular maintenance, such as valves and controllers outside the clear recovery zone or behind safety devices. Narrow areas and areas behind the gore should be paved.
- Automated Irrigation - Use automated irrigation systems and remote control devices to minimize worker exposure and allow for effective water management. Valves should be clustered and placed adjacent to maintenance vehicle

pullouts, access paths or made accessible from outside the right of way via access gates.

- Median Planting - Median planting should not be permitted on freeways. Exceptions for the planting of freeway medians are approved by the District Director if the planting can be safely maintained.

(c) Maintainability. Maintenance-intensive activities should be identified and minimized by appropriate design. These activities can be determined through field observation or discussion with maintenance personnel during project development. Ongoing communication between designers, landscape specialists, landscape maintenance personnel, and construction inspectors will ensure that maintenance concerns are addressed.

Planting and irrigation shall reflect the goal of reduced herbicide use.

Adequate plant establishment and irrigation test periods shall be provided.

(d) Cost-effectiveness. The design should provide maximum benefit for the long term costs involved. Materials and methods specified should be commercial quality and closely matched to the project conditions.

(e) Resource Conservation. Conservation measures such as the use of regionally appropriate plants, compost, mulches, nonpotable water, automated irrigation systems, remote irrigation control systems (RICS), and moisture sensors will help achieve this goal.

Highway planting should be able to withstand roadside conditions and become established on limited water with minimal maintenance. Planting designs shall account for life-cycle costs including limited maintenance resources.

Trees and vegetation shall be preserved and protected to the maximum extent feasible during the planning, design and construction of transportation projects.

Native species are encouraged throughout the transportation system, where appropriate. Section 130 of the Surface Transportation and Uniform Relocation Act requires at least one quarter of one percent of funds expended for a landscaping project on the Federal Aid System be used to plant native wildflowers. Additional information can be found in the FHWA manual "Roadside Use of Native Plants."

902.2 Sight Distance and Clear Recovery Zone Standards

Sight distance and safety are of primary importance, and are not to be subordinate to aesthetics. Applicable minimum horizontal and vertical sight distance standards are set forth in Topic 201, Sight Distance.

Two types of safety setbacks affect the placement of landscape elements:

- To keep the continuous length of highway ahead visible to the driver (sight distance).
- To keep the clear recovery zone free of physical obstructions.

(1) Sight Distance Setbacks. Sight distance limits are measured from the edge of traveled way to the outside edge of the mature growth. Care shall be taken to ensure that future growth will not obstruct sight distance.

Proposed mature planting should maintain horizontal and vertical sight distance required by the design speed of the facility. In cases where, due to geometric restrictions, the existing facility does not provide 80 miles per hour sight distance, no further reduction should be caused by planting.

For interchanges, all planting shall provide ramp and collector-distributor road sight distance equal to or greater than that required by the design speed criteria with a minimum provision of sight distance for 40 miles per hour. At points within an interchange area where ramp connections or channelization are provided, plantings shall be clear of the shoulders and sight line shown in Figure 504.3J, Location of Ramp Intersections on the Crossroad.

Particular attention should be paid to planting on the inside of curves in interchange loops, in median areas, on the ends of ramps, and on cut slopes so that shoulders are clear and designed sight distances are retained.

Sight distance setbacks restrict the height of plants or the horizontal distance of plants from the traveled way. Low growing plants may be placed in front of the setbacks as long as the requirements for sight distance are met as discussed in Index 201.6 and illustrated in Figure 201.6. Taller growing plants shall be placed beyond these setbacks. In interchange areas, generally, from the edge of traveled way, a 50-foot setback within the loops is considered as the sight distance setback for trees and shrubs that will grow above a 2-foot height.

(2) Clear Recovery Zone. Recovery zone setbacks provide areas for errant vehicles to regain control. The policy along freeways and expressways, including interchange areas, should be to strive for 40 feet or more of clearance between the edge of traveled way and large trees, but with a minimum clearance of 30 feet. Special considerations should be given to providing additional clearance in potential recovery areas. The 30-foot distance is measured horizontally to the trunk of the tree. For setback purposes, large trees are defined as plants which at maturity, or within 10 years, have trunks 4 inches or greater in diameter, measured 4 feet above the ground. Large trees may be planted within the 30-foot limit where they will not constitute a fixed object; for example, on cut slopes above a retaining wall or in areas behind guardrailing which has been placed for reasons other than the tree planting.

Small trees are those with smaller trunks or plants usually considered shrubs, but trained in tree form which would not develop 4-inch diameter trunks within 10 years. Examples of small trees are Western Redbud (Cercis occidentalis), Crape Myrtle (Lagerstroemia indica), Bottle Brush (Callistemon sp.), and Oleander (Nerium oleander).

Exceptions to the 30-foot setback may also be considered on cut slopes which are 2:1 or steeper or where there are physical barriers such as retaining walls. The minimum setback in these cases should be 25 feet.

Offset distances greater than 30 feet should be provided at locations such as on the outside of horizontal curves, near ramp gores, at points of congestion, or where evasive maneuvers may be required.

Large trees should not be planted in unprotected areas of freeway or expressway medians with the possible exception of separated roadways with medians of sufficient width to meet the setback requirements for tree planting.

902.3 Planting Guidelines

(1) Design Procedures. An overview of the project development process is covered in the Project Development Procedures Manual.

(2) Plant Selection. Plants should be tolerant of local environmental conditions such as sunlight, aspect, water availability, temperature, soil, water quality, air quality, and wind, as well as proven to be durable adjacent to highways and in transportation facilities. California native plants should be incorporated into the design, taking into account local plant communities and species availability, to the maximum extent feasible.

Plants should have the proper growth rate, longevity, size, and appearance for their intended uses. Wherever feasible, trees should be used to create the main structure of the planting composition. Plants should not require regular, ongoing maintenance other than irrigation.

A diversity of plant material should be chosen. Monoculture planting is discouraged.

Drought tolerant plants which will have the greatest chance of survival if water were to become unavailable should be selected. Species must be suitable for the project site.

If plant tolerances are questionable, the species should be avoided or used on a limited experimental basis.

Trees generally recognized to be brittle, susceptible to disease, or that increase in size by suckering, should not be selected.

Plants with edible or attractive fruits, berries or nuts should not be selected.

When appropriate, planting projects must include California native wildflowers as an integral and permanent part of the planting design. The Project Development Procedures Manual discusses wildflower requirements.

(3) *Plant Location.* When locating plants, the mature size, form, and characteristics of the species should be considered, particularly for safety of maintenance workers and the traveling public, and long-term maintenance costs.

Plants should be located so that pruning will not be required. Trees should not be planted under overhead utilities or structures.

Plants should be located so that they will not obscure existing billboards, or on-premise business identification signs for a distance of 500 feet from the billboard sign.

Plants with similar water requirements should be grouped for irrigation purposes.

Plants with thorns or known to be poisonous to humans and animals, (e.g., Rose, Oleander), should not be planted adjacent to areas used for grazing animals, equestrian activities, with high public exposure, or where children have access to the planting. Designers should be aware of State and local restrictions on the planting of certain species in or adjacent to specified areas.

In areas subject to frost and snow, plantings should not be located where they will cast shade and create patches of ice on vehicle or pedestrian ways.

(4) *Trees Planted on Conventional Highways.* Safety, sight distance standards, environmental needs and maintainability are the primary concerns when establishing the locations for tree planting on conventional highways.

Trees shall not restrict sight distance requirements.

Trees shall not visually restrict existing signs and signals.

Trees in the median shall be at least 100 feet from the longitudinal end of the median.

Trees shall be at least 20 feet from any manholes.

A minimum height clearance of 15 feet from the pavement to the lower foliage of overhanging branches is necessary to provide for the passage of trucks. The size, shape, and maturity of the tree should be considered if trimming is necessary to maintain vertical clearances. Trees, which will ultimately become very wide, are undesirable if routine maintenance will cause interference with traffic flow.

Large trees are defined in Index 902.2(2).

Tree species proposed for planting in conventional highway medians must be approved by the Landscape Architecture Program, District Coordinator.

The locations for planting large trees fall into one of five categories below, (a), (b), (c), (d), or (e). Distances are measured to the anticipated mature face of tree trunk.

(a) The planting of large trees should be permitted on the roadside (excluding medians) with posted speeds of 35 miles per hour or less without curb or barrier, or with posted speeds of greater than 35 miles per hour with the following condition:

- Trees should be planted at least 30 feet from the edge of traveled way.

(b) The planting of large trees should be permitted on the roadside of conventional highways (excluding medians) with posted speeds of 35 miles per hour or less with curb or barrier with the following conditions:

- Where a curb exists, trees should be planted at least 18 inches from the face of the curb.

- Where a barrier exists, trees should be planted at least the deflection distance associated with the specific barrier type from the face of the barrier.

(c) **The planting of large trees shall be permitted in medians with posted speeds of 35 miles per hour or less, only if the following conditions are met:**

- There is a curb or barrier between the traveled way and the trees.
- Trees are at least 5 feet from the face of the curb.
- For concrete barriers, the tree shall be a minimum of 18 inches from the face of the barrier.
- For other barrier types, the tree shall be set back a minimum of the deflection distance associated with the specific barrier type, but not less than 18 inches.

(d) **The planting of large trees shall be permitted in medians, with posted speeds of 45 miles per hour or less, only if the following conditions are met:**

- Trees shall be shielded by an approved barrier.
- For concrete barriers, the tree shall be a minimum of 18 inches from the face of the barrier.
- For other barrier types, the tree shall be set back a minimum of the deflection distance associated with the specific barrier type, but not less than 18 inches.

(e) **The planting of large trees shall not be permitted in medians, with posted speeds of greater than 45 miles per hour.** Exceptions to this standard require the approval of the Design Coordinator and the concurrence of the Headquarters Traffic Liaison.

(5) Planting on or Near Walls. Vine planting should be included with all sound barrier projects to reduce the potential for graffiti and to soften the appearance of the wall. If retaining walls or sound barriers are located within the clear recovery zone (see Index 902.2), plants may be placed behind the walls and be allowed to grow over (or through) the wall, or plants may be placed in front of the wall, but they must be behind a concrete safety shaped barrier that is placed to shield something other than plants. Plants are not permitted on concrete safety shaped barriers on the traffic side, unless an exception is granted from the Division of Traffic Operations and all of the following requirements are met:

(a) Only vines which have a natural tendency to cling to noise barriers or retaining walls may be planted on the traffic side of barriers. Support structures on walls should not be used. The vines must readily adhere to the barriers. No shrubs or ground cover will be allowed. Vines such as Creeping Fig (Ficus pumila) and Algerian Ivy (Hedera canariensis) will not be allowed due to their habit of peeling off hard surfaces at maturity.

(b) Plant basins must be depressed and minimal in size. Ground surface irregularities must be insignificant or nonexistent.

(c) Each plant must be individually irrigated. The plants should not encroach onto the shoulder or create sight distance problems.

The Maintenance Unit should be consulted as vines planted on walls may require maintenance access for pruning. See Index 1102.7 for maintenance considerations in noise barrier design.

(6) Planting of Vines on Bridge Structures. Vines should not be planted where they might grow over any portion of the bridge structure. When the regular inspection of bridge structures is required and where rapid visual inspection of these structures is required in areas of high seismic activity, the planting of vines on bridge structures or columns is not permitted. There are certain conditions such as low average daily traffic, high redundancy in the substructure, etc. where exceptions from Structure Maintenance may be granted,

after all risk vs. benefit factors are considered, to plant vines.

(7) *Planting in Vicinity of Airports and Heliports.* All plants must not exceed the height restriction standards contained in Topic 207 of this manual. Mature plant height must be used to determine if the plant(s) will be considered an obstruction to navigable airspace.

902.4 Irrigation Guidelines

(1) *General.* Irrigation systems and components should be designed to conserve water, minimize maintenance, minimize worker exposure to traffic, and sustain the planting. The design should be simple, efficient, and straightfor-ward. Irrigation concepts utilized should conform to local water conservation goals.

Whenever available, water sources should be nonpotable, e.g., reclaimed or untreated water sources, consistent with quality and health standards, and the cost should be justified (see the Project Development Procedures Manual for cost guidelines). Water quality should be considered when selecting components and designing the system.

Standard, commercially available irrigation components should be used and special features should not be specified unless they are required to solve unique problems of the site.

Security measures, such as locking cabinets, enclosures and valve boxes should be provided.

Potential damage from pedestrians or vehicles should be considered when selecting and locating all irrigation components. Irrigation components such as controllers, valves, backflow preventers, and booster pumps shall be placed away from gores, narrow areas, decision points, and preferably located behind barriers or shielded by a structure.

(2) *Valves and Sprinklers.* Irrigation systems should be designed for automatic operation. When systems are temporary or will be used infrequently, manual, battery, solar or timer-operated valves may be used.

Control valves shall be in manifolds where practical and a ball valve shall be provided.

When appropriate, trees and shrubs, spaced more than 10 feet on center, shall be individually watered.

Overhead irrigation systems, e.g., impact or gear driven sprinklers, should be primarily used for irrigating low shrub masses, ground cover and for establishing native grasses. Trees in overhead irrigated ground cover areas should receive supplemental basin water. Sprinklers should be appropriate for local wind and soil conditions. Sprinklers adjacent to the roadway should be selected and placed to avoid spray on the roadway. Sprinklers, other than pop-up, subject to being driven over should be relocated or provided with sprinkler protectors, flexible risers, or flow shutoff devices. Sprinkler protectors should be used on pop-up sprinklers and quick coupling valves adjacent to pavement.

(3) *Controllers.* Irrigation controllers shall be easily accessible, located in enclosures, protected from vehicular traffic, and in an area with good lighting and visibility to oncoming traffic. Controllers shall not be located near shoulders, in or near dense shrubbery, or in the path of the spray of sprinklers.

(4) *Backflow Preventers.* The use of reduced pressure principle backflow devices are required for highway planting projects. Master remote control valves should be used at all pressured water sources directly downstream of the backflow preventers. Backflow preventers should be located in enclosures.

(5) *Booster Pump Systems.* When local agency water pressure is insufficient, booster pumps may be included in the irrigation design. Design of a booster pump system should be coordinated with DES-SD, Office of Electrical, Mechanical, Water and Wastewater Engineering (OEMW&W). After the irrigation system has been designed such that all branches have close to equal flowrate requirements, the booster pump system design request should be prepared including flowrate and discharge pressure needed for the pump, the availability for power distribution, and